CofC

PATENT
Attorney Docket No.: 81005-0009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
Jan Henrik JEBSEN, et al.

Patent. No.: 6,805,055 B1
(Issued October 19, 2004)

Application No.: 10/603,090

For: PLASMA FIRING MECHANISM AND METHOD FOR FIRING AMMUNITION

REQUEST FOR
CERTIFICATE OF CORRECTION UNDER 37 CFR 1.322(a)

Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants respectfully request a Certificate of Correction under 37 CFR 1.322(a) be entered in the above-identified patent. This request is being submitted to correct two errors in the issued patent referenced above, as enumerated on the attached Certificate of Correction Form PTO/SB/44. We also attach a copy of pages 3 and 26 (the Abstract) from the original application. The underlined words show the correct language from the original application. It is evident from the attached Abstract that the error in the issued patent arose through the fault of the Patent Office. Accordingly, Applicant does not believe any fees are required to process this request. However, in the event any fees are due or required, please charge the undersigned's Deposit Account No. 50-1129.

Respectfully submitted,
WILEY REIN & FIELDING LLP

Date: September 7, 2005

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PTO/SB/44 (02-01)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO : 6,805,055 B1

DATED : October 19, 2004

INVENTOR(S) : Jan Henrik Jebsen and Gerard Aknine

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 2, Line 65, Specification:
change "ring" to --firing--.

In the Abstract, Line 1:
change "comprised" to --comprises--.

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PATENT NO. 6,805,055 B1

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electrical percussion system, the mechanical firing pin is replaced by an electrically conductive firing pin that makes good electrical contact with an electrical primer prior to initiating a firing sequence. The electrically primed cartridges have an electrically conductive portion that is grounded electrically to the walls of the firing chamber. One serious drawback of electric percussion is the requirement for specialized ammunition with embedded electrodes. Conventional primer initiated ammunition will not work in a weapon designed for electric percussion and the specialized ammunition with embedded electrodes will not work with conventional weapons. This prevents interoperability or sharing of ammunition and complicates logistics for supply of military units that employ both conventional and electric percussion weapons.

[0008] Another possible alternative to mechanical primed ammunition, particularly in the artillery context, is laser-fired ammunition. For laser-fired artillery systems, the projectile and propellant are loaded in conventional fashion, but the mechanical primer and firing pin are replaced by a laser firing system that is typically integral to the breech block of the cannon. An optical window is provided in the breech block to allow the passage of high energy, pulsed laser light into the propellant chamber to directly ignite the propellant ignition pad and fire the projectile. The laser firing system eliminates the complexity and delays caused by the loading of a mechanical primer and mechanical percussion by the firing pin. However, laser firing systems (none of which have been placed into production) are generally expensive and require considerable development and manufacturing time when compared to mechanical primer systems. In addition, the optical viewing window of the laser system must be sealed against the pressure and heat of the propellant chamber while maintaining suitable optical properties. The combination of heat, pressure, and propellant residue from the propellant chamber and the laser energy passing through the viewing window can cause clouding, obscuration, and/or pitting of the viewing window over time, resulting in degraded performance of the laser ignition system.

[0009] Thus, the firing methods used in current firearms, aircraft and watercraft armaments, and artillery suffer from a number of deficiencies. For example, the rate of fire is predetermined by the selection of mechanical parts and the type of ammunition cannot be varied once the weapon is built. Maximum firing rate for a particular type of

Abstract

The invention comprises a device and method for firing firearm ammunition using a plasma torch generator. In a particular embodiment, the device relates to the control or management of the rate of fire and number of rounds fired in a burst firing mode for automatic firearms. The device can be incorporated into firearms of a variety of sizes and configurations to provide precise control of the rate of fire. The device and method can be applied to conventional mechanical primer ammunition or used without the need for a primer, particularly in field artillery, aircarft, and watercraft.

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(12) **United States Patent**
Jebsen et al.

(10) **Patent No.: US 6,805,055 B1**
(45) **Date of Patent: Oct. 19, 2004**

(54) **PLASMA FIRING MECHANISM AND METHOD FOR FIRING AMMUNITION**

(75) Inventors: **Jan Henrik Jebsen**, Nyon (CH); **Gerard Aknine**, Nyon (CH)

(73) Assignee: **Gamma Recherches & Technologies Patent SA**, Nyon (CH)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/603,090**

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(51) **Int. Cl.**[7] **C06C 9/00**
(52) **U.S. Cl.** **102/205**
(58) **Field of Search** 102/205, 470, 102/472; 89/8, 7; 42/84

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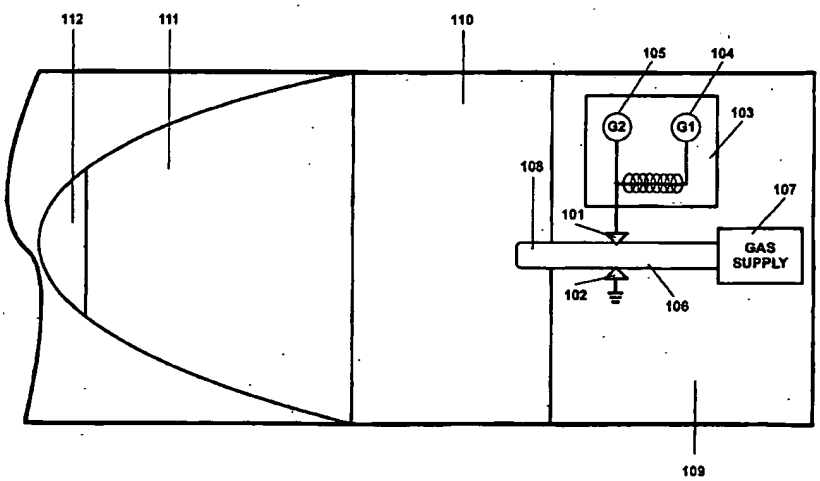
(57) **ABSTRACT**

The invention comprised a device and method for firing firearm ammunition using a plasma torch generator. In a particular embodiment, the device relates to the control or management of the rate of fire and number of rounds fired in a burst firing mode for automatic firearms. The device can be incorporated into firearms of a variety of sizes and configurations to provide precise control of the rate of fire. The device and method can be applied to conventional mechanical primer ammunition or used without the need for a primer, particularly in field artillery, aircarft, and watercraft.

39 Claims, 7 Drawing Sheets



PLASMA FIRING MECHANISM AND METHOD FOR FIRING AMMUNITION

FIELD OF INVENTION

This invention relates to plasma firing mechanism for firearms, methods for firing firearms, and methods for controlling the firing of firearms. In a particular embodiment, the mechanism or device more effectively controls and/or manages the rate of fire and the number of rounds fired for automatic firearms.

BACKGROUND FOR AND INTRODUCTION TO THE INVENTION

Historically, semiautomatic and automatic weapons used mechanical percussion to fire a conventional cartridge comprising a primer or a casing containing a quantity of gunpowder or other explosive or propellant material. The casing is typically cylindrical in shape with a bullet that is initially lodged in one end of the cartridge and a primer located in the opposite end. A mechanism for detonating the primer typically includes a hammer and firing pin propelled by the force of a spring or other suitable mechanism. The movement of the hammer and the firing pin is initiated by pulling the trigger. The inertia of the hammer and firing pin introduces a time lag, sometimes called lock time, between the trigger pull and detonation of the primer. The percussion primer detonates when struck by the firing pin, igniting the gunpowder and ejecting the bullet from the cartridge under the pressure created by the expanding gases created by the exploding gunpowder.

The use of a mechanical firing pin creates a risk that the firing pin may strike the primer too hard and penetrate the primer. This creates a path for the expanding gases to escape through the breach in the primer, which reduces the pressure available to propel the bullet and increases the chance of injury to the operator or damage to the weapon. Mechanical firing systems are also subject to wear with subsequent deterioration of performance.

In order to fire multiple rounds of ammunition, a percussion and reload cycle is established, wherein the spent casing is removed from the firing chamber, a fresh round of ammunition is chambered, and the firing pin strikes the primer of the fresh round of ammunition to repeat the process. For semiautomatic weapons, the movement of the firing pin is initiated by successive pull and release of a trigger, with a single round being fired for each pull of the trigger. For automatic weapons, a single pull of the trigger causes the firing pin to strike the primer of each successive round of ammunition without further operator interaction. The rates of fire of such conventional automatic weapons generally are a function of the time it takes for the percussion and reload cycle to be completed. The length of this cycle is largely a function of the time it takes for the mechanical parts to move through their range of motion.

Once the mechanical parts and ammunition are selected for a particular firearm design, the firing rate typically is set and cannot be adjusted by the operator. Moreover, the practical maximum firing rate for automatic weapons is limited by the cycle time of the mechanical parts. This may be disadvantageous in certain circumstances because a reduced number of rounds may be placed on a fast moving target before it moves out of range of the automatic weapon, leading to a lower target hit rate.

In certain circumstances, fully automatic firing can lead to excessive ammunition use without a corresponding increase in target kill rate and, thus, the depletion of available ammunition on a particular sortie. One solution to this problem is to employ a lower rate of fire to limit the excessive use of ammunition. Alternatively, a burst firing mode can be used wherein a single trigger pull causes a set number of rounds to fire, rather than continuing to fire ammunition until the trigger is released, as is the case in conventional fully automatic weapons. The number of rounds fired in burst firing mode is typically also a function of the action of the mechanical parts of the weapon and thus cannot be varied by the operator. Because the firing of successive rounds occurs without operator interaction or control, the operator is unable in conventional systems to select the precise timing of firing any particular round or to vary the firing rate in other situations.

Other types of priming systems exist and others have been proposed, especially for large caliber artillery ammunition and aircraft and watercraft armaments. In the case of aircraft armaments in particular, one alternative to mechanical percussion is electrical percussion, which is used with electrical primer ammunition. In an electrical percussion system, the mechanical firing pin is replaced by an electrically conductive firing pin that makes good electrical contact with an electrical primer prior to initiating a firing sequence. The electrically primed cartridges have an electrically conductive portion that is grounded electrically to the walls of the firing chamber. One serious drawback of electric percussion is the requirement for specialized ammunition with embedded electrodes. Conventional primer initiated ammunition will not work in a weapon designed for electric percussion and the specialized ammunition with embedded electrodes will not work with conventional weapons. This prevents interoperability or sharing of ammunition and complicates logistics for supply of military units that employ both conventional and electric percussion weapons.

Another possible alternative to mechanical primed ammunition, particularly in the artillery context, is laser-fired ammunition. For laser-fired artillery systems, the projectile and propellant are loaded in conventional fashion, but the mechanical primer and firing pin are replaced by a laser firing system that is typically integral to the breech block of the cannon. An optical window is provided in the breech block to allow the passage of high energy, pulsed laser light into the propellant chamber to directly ignite the propellant ignition pad and fire the projectile. The laser firing system eliminates the complexity and delays caused by the loading of a mechanical primer and mechanical percussion by the firing pin. However, laser firing systems (none of which have been placed into production) are generally expensive and require considerable development and manufacturing time when compared to mechanical primer systems. In addition, the optical viewing window of the laser system must be sealed against the pressure and heat of the propellant chamber while maintaining suitable optical properties. The combination of heat, pressure, and propellant residue from the propellant chamber and the laser energy passing through the viewing window can cause clouding, obscuration, and/or pitting of the viewing window over time, resulting in degraded performance of the laser ignition system.

Thus, the firing methods used in current firearms, aircraft and watercraft armaments, and artillery suffer from a number of deficiencies. For example, the rate of fire is predetermined by the selection of mechanical parts and the type of ammunition cannot be varied once the weapon is built. Maximum ring rate for a particular type of ammunition is limited by the cycle time of the mechanical parts. Once the weapon is designed and built the operator cannot control the